



Vision Deficiency and Commercial Motor Vehicle Driver Safety

Findings of Evidence Report

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Issues Considered

- Monocular vision and driver safety
- Red-green color deficiencies and driver safety
- Visual field loss and driver safety
- Cataract and driver safety
- Diplopia and driver safety



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Searches

Name of database	Date limits	Platform/provider
CINAHL (Cumulative Index to Nursing and Allied Health Literature)	Through December 3 2007	OVID
Cochrane Library	Through 2007 Issue 4	www.thecochranelibrary.com
Embase (Excerpta Medica)	Through December 3 2007	OVID
Medline	Through December 3 2007	OVID
PubMed (Pre Medline)	Through December 3 2007	www.pubmed.gov
TRIS Online (Transportation Research Information Service Database)	Through December 3 2007	http://trisonline.bts.gov/search.cfm
PsycINFO	Through December 3 2007	OVID
National Guideline Clearinghouse™ (NGC™)	Searched September 21 2007	www.ngc.gov
Health Technology Assessment Database (HTA)	Through 2007 Issue 4	www.thecochranelibrary.com

Monocular Vision and Driver Safety

- Crash data:
 - 3 studies (median quality: low)
 - N = 74 drivers with monocular vision
 - None specifically enrolled CMV drivers
 - 1 study found an increased crash risk associated with monocular vision
 - 2 studies did not



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Monocular Vision and Driver Safety

- Simulated driving performance:
 - 1 study (low quality)
 - N=40 monocular CMV drivers
 - Comparison group: CMV drivers with binocular vision
 - Assessed recognition distance, mirror checks, lane keeping, clearance judgment, and gap errors
 - No between groups difference in simulated driving performance:- Exception: poorer sign recognition among monocular drivers



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Monocular Vision and Driver Safety- **Summary**

- **It remains unclear whether individuals with monocular vision can safely operate a CMV**



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Red-Green Color Deficiency and Driver Safety

- Crash data
 - 1 study (moderate-quality)
 - N = 151 color-deficient drivers compared to normal vision controls
 - Difference in self-reported crash rate assessed
 - No between-group difference found



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Red-Green Color Deficiency and Driver Safety

- Signal recognition and response times
 - 2 small, low-quality studies found that color deficient individuals made more signal recognition errors than color vision normals
 - 1 small, low-quality study found that individuals with color deficiency responded more slowly to colored signals than color vision normals



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Red-Green Color Deficiency and Driver Safety - Summary

- **No data from CMV drivers**
- **There is some evidence that red-green color deficiency may impact ability of some individuals to recognize and react to traffic signals and lights**
- **No evidence that individuals with a red-green color deficiency are at an increased risk for a crash**



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Visual Field Loss and Driver Safety

- Crash data:
 - Standard perimetry (automated or manual)
 - 12 studies (Quality: low/moderate)
 - N = 62,492 drivers
 - 8 of 12 studies found statistically significant associations between VF loss and increased crash risk
 - Optimal field testing parameters could not be determined



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Visual Field Loss and Driver Safety

– Crash Studies

- Crash data:
 - Useful Field of View (UFOV) Test
 - 6 studies (median quality: moderate) that enrolled 4,447 drivers
 - All studies showed a statistically significant increase in crash risk associated with VF loss
 - 3 studies found a statistically significant increase in crash risk associated with a $\geq 40\%$ loss on the UFOV test



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Visual Field Loss and Driver Safety - **Summary**

- **No data specific to CMV drivers.**
- **VF loss measured by standard perimetry is a risk factor for a crash**
- **Optimal VF testing parameters for predicting crash could not be determined**
- **UFOV loss is a risk factor for crash**
- **UFOV loss of $\geq 40\%$**



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Cataracts and Driver Safety– Crash Data

- 4 studies (Quality: moderate) that enrolled N=943 drivers
- 1 study found that individuals with cataracts are at an increased risk for a motor vehicle crash; the remaining 3 studies did not.
- Study that reported increased crash risk with non-surgically treated cataracts found that crash risk was reduced with surgical treatment.



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Cataracts and Driver Safety - **Summary**

- **No data specific to CMV drivers**
- **It is plausible that visual deficits that result from cataract (glare, reduced VA, diplopia) may have a deleterious impact driver safety**
- **The visual deficits associated with cataract can be reversed in most individuals through cataract surgery**



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Diplopia and Driver Safety – Crash Studies

- 1 case-control study (low quality) that included a total of 10 drivers with diplopia
- Prevalence of diplopia evaluated among drivers who crashed and drivers who did not crash compared
- No evidence of increased crash risk for drivers with diplopia



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Diplopia and Driver Safety – Indirect Evidence

- *Simulated Driving Performance*
 - 1 moderate-quality study of 10 drivers with diplopia compared to drivers without diplopia
 - No between-group difference was found in recognition responses or reaction times
 - Although consistent with the crash study findings, two small studies of low-to-moderate quality are insufficient to rule out the possibility of an increased risk



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Diplopia and Driver Safety

- **No data specific to CMV drivers**
- **Evidence (2 crash studies and a simulated driving performance study) does not provide evidence that the safety of drivers with diplopia is compromised**



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